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**Critical Care Medicine**

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## **CRITICAL CARE MEDICINE**

Arrow International, Inc. combines technology and product innovation to extend the use of catheterization for the diagnosis and treatment of critically ill patients. Arrow disposable critical care catheterization products are used principally to access the central vascular system for administration of fluids, drugs and blood products. These products are also used for patient monitoring, diagnosis and pain management. Market studies indicate that Arrow is a leading supplier of central vascular access catheterization products worldwide.

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### **Arterial Catheterization Systems**

**Arrow Arterial Catheters are easier with the first catheter designed specifically for arterial use.**

- The Arrow Radial Artery Catheter features a patented<sup>1</sup> integral spring-wire guide technique.
- Saves placement time, procedure after procedure.
- Extra-short bevel on the introducer needle, and the precision fit between the needle bevel heel and catheter tip, facilitate accurate placement within the vessel lumen.

**Improves difficult intravenous catheterization, too.**

- Uses the same highly effective spring-wire guide technique.

**Inhibits blood exposure.**

- Blood flashback in the clear hub of the introducer needle shows successful entry.
- Simple actuating lever advances the spring-wire guide through the needle lumen into the vessel.

**Excellent stability and indwelling characteristics.**

- Arrow's polyurethane construction softens in situ, offers excellent thromboresistance and biocompatibility, and minimizes trauma to vessel walls.
- Exhibits exceptional mechanical characteristics of strength, abrasion resistance and hydrolytic stability.

**Minimizes kinking, eases advancement.**

- The catheter is reinforced at the hub juncture to minimize kinking at this maximum

stress point.

- Integral suture wing available in some sizes.
- Arrow's exclusive all-in-one design offers protection and eases advancement.
- Spring-wire guide provides a supportive track for positive catheter placement.

#### **Easier, less traumatic femoral artery catheterization.**

- Arrow's longer length catheters have a peel-away guard over the catheter-over-needle assembly which helps to protect against contamination and supports the catheter during advancement.

#### **Designed to meet all your specific treatment and cost-containment needs.**

- Arrow Radial Artery Catheterization systems are packaged as complete kits, sets, or with key individual components only.
- Save time, reduce inventory expense. Everything needed is packaged sterile in each kit.
- Outer package can be utilized as an arm board.
- Other arterial line kits available using the Seldinger technique.

#### **Arrow QuickFlash® Arterial Catheters**

#### **Safer, more reliable arterial placements with virtually instantaneous sign of arterial access.**

- Arrow QuickFlash® Arterial Catheters let you know when to stop needle insertion and help you avoid the accidental puncture of both arterial walls.
- As soon as you enter the artery, windows along the introducer needle immediately indicate blood flow through the transparent polyurethane catheter.

#### **Simpler placements, easier insertions.**

- Patented spring-wire guide technique available in a variety of sizes.
- Extra-short needle bevel with precision fit between bevel heel and catheter tip improves simultaneous placement of needle and catheter in vessel lumen.
- Actuating lever simplifies spring-wire guide and catheter advancement into vessel.
- Clear introducer needle and hub and plastic feed tube allow easy visualization of blood flashback.
- Hydrophilic coating helps smooth insertion.
- Shorter spring-wire assembly eases handling and permits a one-handed insertion technique.
- Polyurethane material softens in situ for outstanding thromboresistance, kink resistance, and minimization of vessel wall trauma.

#### **The leader in innovative solutions.**

At Arrow, everything we do is focused on improving patient outcomes. We listen carefully to clinicians' needs and respond with innovative, practical, cost-effective solutions. By continually providing a new generation of technologically advanced, high quality medical products, Arrow remains the industry leader – Powered by innovation™

1. U.S. Patent Nos. 4,417,866 and 5,246,426

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### **Central Venous Access Systems**

Arrow International offers the broadest range of catheters in the industry. We carry more sizes, more lengths, more varied flow rates, and more complete kits and sets for clinicians than any other catheter company.

In fact, Arrow pioneered the comprehensive catheter kit. Today, Arrow kits remain the industry standard for design and convenience.

Other exclusive innovations, like our patented ARROWg+ard® antimicrobial surface<sup>2</sup>, Blue FlexTip®, and the Arrow® Raulerson Syringe<sup>3</sup> further explain why our catheters are chosen first by countless healthcare professionals worldwide.

Above all, we offer products of unsurpassed quality...something you can actually *feel* every time you place an Arrow catheter.

Around the hospital and around the globe, Arrow continues to be the most trusted name in central venous access. Preferred by millions. Proven by performance. Powered by Innovation™.

#### **Less intimal damage, irritation and reduces perforation risk**

- Most Arrow catheters feature the Arrow Blue FlexTip®, an integral catheter tip which is more pliant than the catheter body. It remains patent yet deflects in case of inadvertent contact with the vessel wall.

#### **Excellent indwelling characteristics**

- The flexible thromboresistant polyurethane material softens in situ.

#### **Less trauma**

- The Arrow® Raulerson Introducer Syringe<sup>3</sup> has a hollow plunger/barrel containing a patented valving system. It allows a spring-wire guide to be placed directly through the syringe into the vessel lumen so there's less trauma, less blood exposure risk, and virtually no chance for air embolism.

#### **More efficient placements**

- The Arrow Advancer™ saves you time and money by helping you easily straighten the J-tip of the spring-wire guide and insert it with one hand, advancing it to the proper position with your thumb. Or, if using a simple straightening tube is preferred, the translucent blue straightening tube portion of the Arrow Advancer™ can be disconnected from the unit and used separately.

#### **More accurate placements**

- A centimeter-marked spring-wire guide (.025", .032" and .035" diameters available) lets you know how much wire you have inserted and helps you avoid entering the heart. And catheter centimeter markings aid in determining insertion depth.

#### **Dependable and user friendly**

- Clear, integral extension lines with detachable clamps allow you to maintain the catheter away from the insertion site, easily visualize infusates and reduce the risk of air embolism.

#### **Helps prevent accidents**

- SharpsAway® offers a simple yet effective method for sharps disposal.

#### **Improves patient comfort**

- Molded, flexible low-profile junction hubs increase patient comfort and facilitate cleaning.

#### **Exceptional convenience**

- Everything needed for a CVC procedure is included in Arrow's complete line of standard CVC kits and sets.
- Helping alleviate patient concerns about comfort and appearance.
- Can be contoured to each patient's body.
- Pliable lines can be bent into virtually any position while maintaining their

patency...unlike preshaped IJ catheters that can be irritating to patients.

- Remarkable design makes the catheters less conspicuous and patients more comfortable.
- Malleable extension lines help support dialysis lines, thereby helping to prevent crimping and kinking.

#### **Latex-free components for safety and peace of mind.**

ARROWgard Blue® 1 Central Venous Catheters are the only antimicrobial CVCs with a decade of proven effectiveness.

#### **Recognized by its blue body, the ARROWgard® technology is available on a wide variety of catheter sizes.**

- ARROWgard Blue® CVCs feature a patented colonization-resistant surface treatment that molecularly bonds two agents, chlorhexidine (a well-known antiseptic) and silver sulfadiazine, onto the polyurethane catheter material along each catheter's entire indwelling surface length.
- Reduces the incidence of CVC-related bacteremia up to 80%.

#### **Proven antimicrobial action against major catheter-related nosocomial pathogens.<sup>4</sup>**

#### **Longer safe indwelling period.**

- A clinical trial noted considerable lengthening of the safe indwelling period for ARROWgard Blue® catheters compared to control catheters.<sup>5</sup>
- No toxic levels of the antimicrobial agents have been found in the use of ARROWgard Blue® catheters.

#### **Virtually eliminates the issue of resistance.**

#### **Lowers healthcare cost by reducing the length of hospital stays.**

#### **Real benefits. Revolutionary features. More options.**

AGB+ Now with Antimicrobial Protection both inside and out. The confidence of Arrow quality PLUS new benefits for added protection.

#### **Helps prevent catheter-related infection**

- Entire internal fluid pathway including catheter, extension lines and hubs are protected.
- External surface now has longer lasting antimicrobial activity.
- AGB+™ catheters utilize the proven antiseptics, chlorhexidine, chlorhexidine acetate and silver sulfadiazine as antimicrobial agents.

#### **Faster, easier identification of product**

- AGB+™ symbol identifies the ARROWgard Blue PLUS™ product line
- Labeling graphics are easily recognizable – even when stacked on the shelf
- Catheter hub is a distinct blue color and displays AGB+™ symbol

2. U.S. Patent Numbers 4,581,028 and 5,019,096.

3. U.S. Patent Numbers 4,813,938 and 5,045,065.

4. Modak SM, SAMPATH BA. Development and evaluation of a new polyurethane central venous catheter: Reducing central venous catheter infections. *Complications in Surgery*. June 1992:23-29.

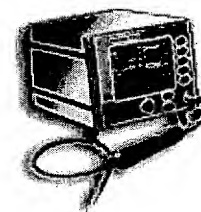
5. Maki DG, Stolz SM, Wheeler S, Mermel LA. Prevention of central venous catheter-related bloodstream infection with an antiseptic-impregnated catheter: a prospective randomized controlled trial. *An Int Med*. August 15, 1997.

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**HEMOSONIC™ - see [www.hemosonic.com](http://www.hemosonic.com)**

**Enjoy the benefits of a comprehensive Hemodynamic Profile.**

- Preload assessment
- Left ventricular contractility at-a-glance
- Afterload assessment on demand
- Fluid optimization results in optimal end tissue perfusion<sup>6</sup>



**Continuous, Real-Time Data makes the HemoSonic™ your Early Warning System.**

- By continuously monitoring **flow**, changes in cardiac output are detected immediately, in **real time**. A drop in flow precedes the subsequent pressure drop, thus allowing an increase in crucial reaction time.
- Continuous output measurement allows for immediate assessment of afterload. (Resistance = Pressure/Output)
- **Acceleration** provides assessment of ventricular contractility.<sup>7</sup>

**Monitor your At-Risk Patients –**

***Without adding risk!***

- Major surgical procedures
- Cardiac patients having non-cardiac surgery
- Elderly patients
- Trauma
- Hemodynamically unstable patients
- ARDS or other pulmonary pathologies
- Multi-organ system failure
- Critically burned patients
- Postoperative/Intensive Care monitoring

**Unique Probe Design ensures reliability.**

The HemoSonic™ employs a patented combination of two ultrasound transducers that measure aortic parameters every twenty milliseconds!

- M-mode echo measures aortic diameter **and** confirms transducer position.
- Pulsed Doppler measures blood velocity at this cross-section.

6. Mythen, MG, Webb AR: Perioperative plasma volume expansion reduces the incidence of gut mucosal hypoperfusion during cardiac surgery. Arch Surg. 1995;130:423-429.

7. Sabbah, et al., Noninvasive evaluation of left ventricular performance based on peak aortic blood acceleration measured with a continuous-wave Doppler velocity meter. Circulation. 1986; 74:323-329.

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**Enhanced versatility gives the Arrow Multi-lumen Access Catheter (MAC™) an advantage over other venous access devices.**



**The Arrow MAC™ offers higher flow rates while performing hemodynamic monitoring.**

Combines the flow rates of a 2-lumen 12 Fr. catheter with the ability to have a thermodilution (TD) catheter in place for hemodynamic monitoring. Large 9+ Fr. distal lumen features improved flows around the indwelling TD catheter.

The device's 12 Ga. Proximal lumen's flow rates are unaffected when a catheter is inserted through the distal lumen.

**Designed for maximum versatility.**

- Three **MAC™** Companion accessories — 1-lumen, 2-lumen and 3-lumen catheters — allow expanded central venous access via a single insertion site.
- Quick, convenient transition from infusion to monitoring capability or vice versa.

**Outstanding kink resistance.**

- Polyurethane catheter body is designed to maintain patency and help prevent kinking.

**Easier access.**

- Familiar locking hemostasis valve connection allows for easy attachment of other Arrow components.
- Multi-lumen juncture hub with low profile is designed to lay flat for patient comfort and ease of anchoring and dressing.

**Easier insertion.**

- Smooth transitions and specialty materials facilitate smooth insertion.
- Latex-free components for safety and peace of mind.

**MAC™ Companion Products**

1-Lumen, 2-Lumen and 3-Lumen Catheter Companion Products are designed to add versatility to the **MAC™**.

- Expanded Access.
- Excellent flow rates.
- Outstanding versatility.
- Fixed indwelling length (13.5cm) when inserted through the **MAC™**.
- Blue FlexTip®.
- Latex Free.
- Peel-a-way catheter contamination guard for increased protection against contamination.

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**Arrow-Trerotola PTD™ (Percutaneous Thrombolytic Device) and Arrow-Trerotola Over-The-Wire PTD™ Decrease the risk, expense and complications associated with surgery or current thrombolytic techniques.**

**Unique mechanical declotting devices from Arrow offer simple design, effective results.**

Two 9mm self-expanding fragmentation baskets conform to graft walls, facilitating removal of residual thrombus.

- Soft, flexible tip maneuvers easily through graft.
- Activated spinning basket macerates the thrombus.
- Dedicated guidewire lumen enables OTW technique.

**Arrow-Trerotola PTD™ (Percutaneous Thrombolytic Device). Simple to use.**

- 5 Fr. diameter outer sheath with an inner torque cable and 65cm usable length.
- Catheter lumen side arm permits fluid administration.
- Hand-held disposable rotator drive unit maintains spinning at 3000 RPM.

Thrombolytic Device)

**Arrow-Trerotola PTD™ OTW Combination Kit.****Designed to ease insertions.**

- Easier transition through tighter radii and excessive thrombus formation within graft by navigating over a guidewire.
- 7 Fr. diameter outer sheath with inner torque cable and 65cm usable length.
- Increased power hand-held disposable rotator drive unit maintains spinning at 3000 RPM.
- Tuohy-Borst cap with Luer-Lock secures guidewire from inadvertent advancements.

**New Arrow High Flow Introducer Sheath with Radiopaque Tip Marker.**

- Radius tip promotes smooth sheath/dilator transition for ease of insertion.
- SnapLock™ dilator promotes dilator/introducer securement during insertion.
- Radiopaque tip marker facilitates appropriate placement for ancillary devices.
- A clear large-bore sidearm and high flow stopcock provides optimal thrombus withdrawal.
- The blue obturator cap accessory creates an occlusion when placed over the introducer hub hemostasis valve and twist locked in position.

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**Percutaneous Sheath Introducer Systems****Built-in infection protection helps to decrease morbidity, mortality, and costly complications.<sup>8</sup>**

- ARROWg+ard®<sup>9</sup>, Arrow's patented colonization-resistant surface technology, combines two well-known antimicrobial agents — silver sulfadiazine and chlorhexidine.
- ARROWg+ard® on central venous catheters reduces the incidence of bacterial colonization by up to 50% and that of catheter-related bacteremia by almost 80%.<sup>8</sup>

**Super Arrow-Flex®<sup>10</sup> sheath with ARROWg+ard®, used with ARROWg+ard Blue® CVCs, provides a system of infection protection from initial course of action through recovery.**

- ARROWg+ard® is molecularly bonded into the polyurethane material along the indwelling length of the PSI.
- Infection protection begins immediately at the crucial point of insertion.
- ARROWg+ard® protection also available in a non-Super Arrow-Flex® Sheath Introducer Assembly.

**Sheath virtually eliminates kinking.**

- Exclusive coil-wire design allows sheath to flex at any point, in any direction, without kinking or collapsing.
- Permits consistent and accurate monitoring, even with patient movement and catheter manipulation.
- Reduces the potential for sheath occlusion during the opening of the chest in open-heart procedures.
- Extremely radiopaque for easy visualization.

**Protection against external contaminants during and after placement.**

- Patented Cath-Gard®<sup>12</sup> shield helps protect the indwelling PA catheter.
- Minimizes the risks involved with catheter manipulation and repositioning.
- Guide tube allows for quick and easy feed-through of the PA catheter.

**Easy securing of catheter and Cath-Gard®.**

- One turn of the TwistLock™ hub gently secures both elements without restricting the flow of vital Infusates or distorting monitor readings.
- TwistLock™ hubs at both ends inhibit catheter movement and secure the proximal end of the Cath-Gard® shield.

**Minimized risk of air embolism or blood loss.**

- Hemostasis valve and lock-on obturator work together to discourage bleed-back and minimize the risk of air embolism.
- Arrow recommends the use of an obturator cap if catheter insertion is delayed or if the catheter is removed. Arrow obturators are available in short valve or long valve and sheath versions. Sheath

**Easy insertions, reduced vessel trauma.**

- Ultra-smooth polyurethane sheath material improves indwelling characteristics.
- Offers exceptional thromboresistance, biocompatibility, and kink resistance.
- Softens in situ to reduce the risk of vessel trauma.

**Increased flow rates.**

- Wider diameter of our 9 Fr. sheath helps you infuse fluids at higher rates up to 1000 cc/min.<sup>13</sup>
- High-flow side port, now available on 8.5 and 9Fr. sheaths, also facilitates increased flow rates.

**Smoother catheter insertions.**

- Patented hydrophilic surface creates the lowest coefficient of friction between sheath and your patient.
- Available on our standard 9 Fr. polyurethane Arrow-Flex® sheaths.
- Eases insertion, reduces vessel trauma, helps enhance maneuverability.

**Secure anchoring of sheath.**

- Integral suture wing enables you to suture the sheath securely to the patient.

**Simplified spring-wire guide placement.**

- The Arrow® Raulerson Syringe<sup>11</sup> allows you to insert a wire guide in one simple step.
- Patented valving system virtually eliminates the risk of air embolism.
- Barrel doubles as a blood-containment device, reducing your exposure to blood-borne pathogens.

Arrow HANDS-OFF® Multiple Lumen Central Venous Access/Infusion System.

**Enhanced infection protection and versatility.**

With today's concerns regarding the risks of PA catheterization<sup>8</sup>, your patient has a versatile alternative. The Arrow HANDS-OFF® Multiple Lumen Central Venous Access/Infusion System allows you to immediately change to multi-lumen therapy (or vice versa), once it's determined that PA catheterization is no longer needed.

- Arrow HANDS-OFF® central venous catheters are designed to be used with Super Arrow-Flex® sheaths with ARROWgard® infection protection.
- A protective Cath-Gard® contamination sleeve virtually eliminates exposure to the external environment. Also reduces the risk of exposure to blood-borne diseases during removal.

**Increased flexibility for treating patients.**

- The Super Arrow-Flex® Sheath Introducer lets you change between diagnostic and therapeutic procedures without having to create another puncture site.



- Patient safety is enhanced.

**Added assurance and ease of procedure.**

- TwistLock™ hub on distal end of the Cath-Gard® prevents catheter movement after it is locked.
- Centimeter markings on the catheter body allow you to more accurately gauge insertion depth.
- Arrow's procedurally complete kits include all the components necessary for PSI procedures.

<sup>8</sup> Maki DG, Stolz SM, Wheeler S, Mermel LA. Prevention of central venous catheter-related bloodstream infection with an antiseptic-impregnated catheter: a prospective randomized controlled trial. *An Int Med.* August 15, 1997.

<sup>9</sup> ARROWgard® is a joint development of Daltex Medical Sciences, Inc., and Arrow International, Inc., using technology developed by Dr. Shanta Modak and colleagues, in the Department of Surgery, Columbia University. U.S. Patent Numbers 4,581,028 and 5,019,096 apply.

<sup>10</sup> Licensed under U.S. Patent Numbers 5,484,425 and 5,180,376.

<sup>11</sup> U.S. Patent Numbers 4,813,938. Other U.S. and foreign patents pending. The Arrow® Raulerson Syringe is a joint development of J. Daniel Raulerson, M.D., and Arrow International, Inc.

<sup>12</sup> U.S. Patent Number 4,515,592.

<sup>13</sup> Without a catheter through the sheath, with high-flow tubing, 300 mmHg.

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**ARROW EPIDURAL PRODUCTS*****Arrow FlexTip Plus Epidural Catheter*****Reduces complications in the epidural space.**

The Arrow FlexTip Plus® combines excellent kink-resistance and superior tensile strength with a soft, flexible tip.

**Provides necessary firmness while maintaining patency.**

- The catheter's unique coil-reinforced body has been engineered to deliver the firmness needed for insertion while providing resistance to kinking or collapsing. Even the coil-reinforced tip is virtually kink-proof.

**Reduced paresthesia risk.**

- The extremely soft distal tip reduces the risk of paresthesia and inadvertent penetration of blood vessels or the dura, which can misdirect delivery of anesthetics.<sup>14,15</sup>

**Latex free.**

- Arrow FlexTip Plus® is made of latex-free materials, eliminating the potential risks associated with allergic reactions to latex.
- Latex-free SnapLock™ adapter also included.

**Simpler and faster epidural procedures.**

- Because of the catheter's unique design, no stylet is required for insertion.
- Two flashback windows in the catheter body permit easy visualization of blood or CSF upon aspiration.
- The catheter is highly radiopaque.
- High quality centimeter markings are easy to read.

**Attaching the adapter is a snap.**

- Arrow's SnapLock™ adapter attaches to the catheter with a single "snap".
- Designed to stay securely in place without impeding flow.

***Arrow TheraCath Epidural Catheter*****Provides exceptional long-term patency.**

The Arrow TheraCath® is designed for longer-term and specialized pain management procedures where patency is an important factor.

**Efficient and effective long-term pain management.**

- The highly kink-resistant catheter provides high compression strength to resist collapsing.
- Features a smooth, durable polymer exterior and an inner spiral-wound stainless steel helix.
- These elements combine to provide patency over extended use and the column strength needed for directionability.

**Uniform disbursement of anesthetic.**

- The stainless steel helical wire is identical to a soft-tip spring-wire guide at the distal tip. Anesthetic is injected through the internal lumen of the jacketed spring-wire helix and is uniformly dispersed through the expanded windings at the uncovered distal tip.

**Simplified placement.**

- A removable stylet, plus a spring-wire guide, simplify and enhance positive placement.

**Adapter can be secured without collapse of the lumen.**

- A simple-to-use SnapLock™ catheter/syringe adapter can be secured positively to the catheter without its collapse.

<sup>14</sup> Junega M, MD, Kargas GA, MD, Miller D, CRNA, Perry E, MD, Gupta B, MD, Pajel V, MD, Botic Z, MD, and Rigor B, MD. Comparisons of Epidural Catheters Induced Parasthesia in Parturients. Poster presentation from the American Society of Regional Anesthesia (A.S.R.A.) meeting: presented April, 1995 - Orlando, FL. *Regional Anesthesia* 1995; 20 (Suppl.):4.

<sup>15</sup> Junega M, MD, Kargas GA, MD, Miller D, CRNA, Perry E, MD, Botic Z, MD, and Rigor B, MD. Incidence of Epidural Vein Cannulation in Parturients with Three Different Epidural Catheters. *Regional Anesthesia* 1996; 21 (Suppl.):4.

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